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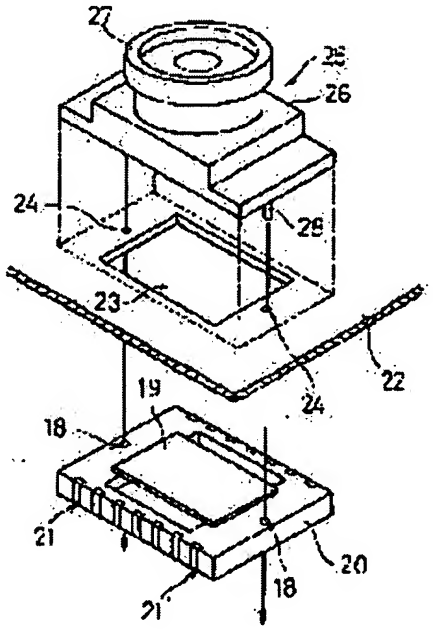
(54) MOUNT METHOD FOR SOLID-STATE IMAGE PICKUP ELEMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To mount a solid-state image pickup element adopting a surface mount type package onto a printed circuit board with a lens.

SOLUTION: A solid-state image pickup element 20 and a lens unit 25 are mounted on the printed circuit board 22 with the board 22 provided with an open window 23 inbetween. A positioning pin 28 is provided to the lens unit 25, and a positioning hole 18 and a through-hole 24 are formed to the solid-state image pickup element 20 and the printed circuit board 22. By inserting the positioning pin 28 through the through-hole 24 of the printed circuit board 22 to the positioning hole 18 of the solid-state image pickup element 20, the solid- state image pickup element 20 and the lens unit 25 are positioned with respect to the printed circuit board 22.



LEGAL STATUS

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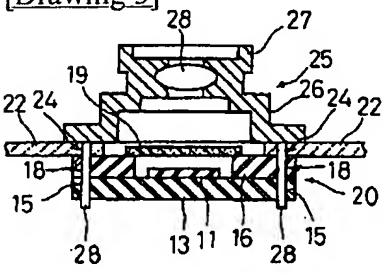
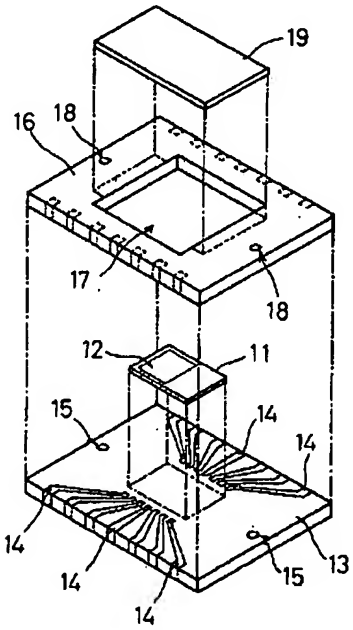
DRAWINGS

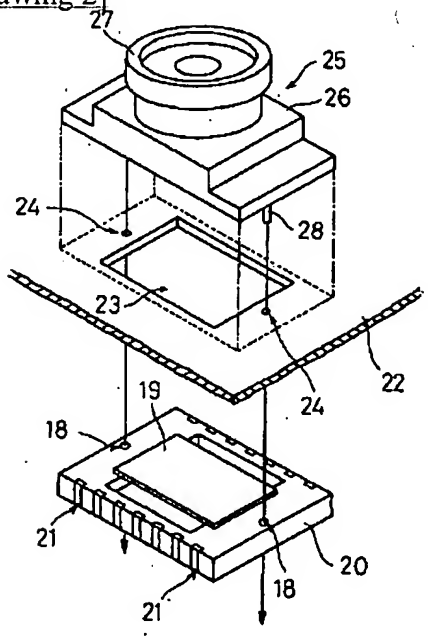
[Drawing 3]



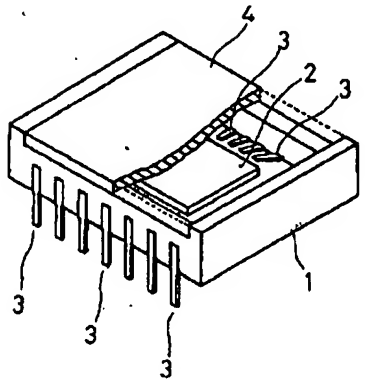
[Drawing 1]



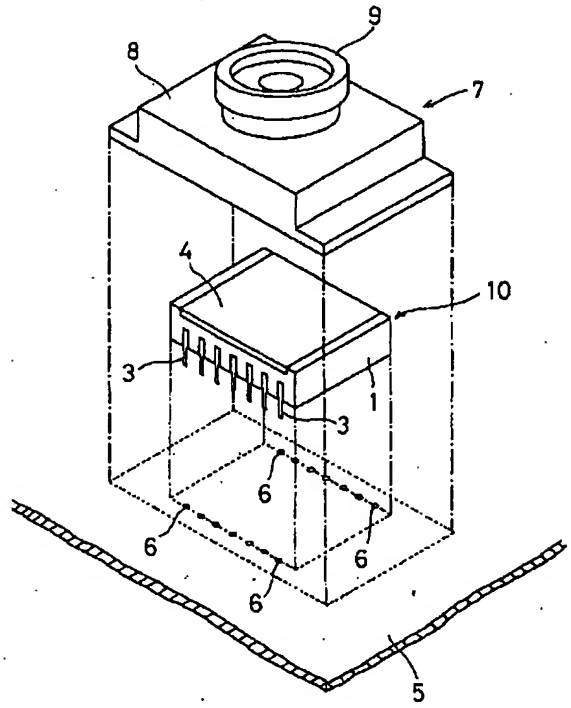
[Drawing 2]



[Drawing 4]



[Drawing 5]



* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the mounting approach of equipping with the solid state image sensor which dedicated the semiconductor chip to the package of a surface mount mold on the circuit board.
[0002]
[Description of the Prior Art] Since the solid state image sensor of the semi-conductor configuration like CCD series needs to copy a photographic subject image on the front face of a sensor chip, opening is formed corresponding to the light-receiving side of a semiconductor chip. For this reason, in the case of a solid state image sensor, more ceramic packages which are easy to form opening than before are used.
[0003] Drawing 4 is the perspective view showing the structure of the conventional solid state image sensor where the ceramic package was used.
[0004] A ceramic package 1 accomplishes the cube type which has the crevice of the predetermined depth, and contains the sensor chip 2 in this crevice. The sensor chip 2 has the shift register which transmits the information charge generated in two or more light-receiving pixel and each light-receiving pixel which are formed of a well-known semi-conductor process on semi-conductor substrates, such as silicon, and the central part of the crevice of a ceramic package 1 is equipped with it. Two or more leads 3 are embedded beforehand at the ceramic package 1, an external lead is arranged along the side face of a ceramic package 1, and an internal lead is arranged at the periphery of the sensor chip 2 in a crevice. The electrode pad prepared in the periphery of the sensor chip 2 by wirebonding as an input/output terminal is connected to the internal lead of these leads 3 of two or more. And the transparence plate 4 consists of glass or acrylic resin, and on a ceramic package 1, as it takes up a crevice, it is equipped with it. Thereby, the closure of the sensor chip 2 is carried out, and wiring which connects the sensor chip 2 and the sensor chip 2, and lead 3 is protected.
[0005] Drawing 5 is a decomposition perspective view explaining the mounting approach of a solid state image sensor.
[0006] A solid state image sensor 10 is the thing of the structure shown in drawing 4 , and two or more leads 3 are arranged on the side face of the ceramic package 1 which contained the sensor chip 2. The circuit board 5 consists of insulating materials, such as a glass epoxy group plate, and the circuit pattern is formed in the whole surface or both sides of copper foil. The through hole 6 corresponding to the lead 3 of a solid state image sensor 10 is formed in this circuit board 5, and a through hole 6 is equipped with a solid state image sensor 10 through lead 3 at a position. And on the circuit board 5, the digital disposal circuit for incorporating the drive circuit for supplying various kinds of driving signals to a solid state image sensor 10 and the output of a solid state image sensor 10, and performing predetermined processing is prepared, and it connects with a solid state image sensor 10 through a circuit pattern.
[0007] The lens unit 7 consists of the mounting section 8 and the lens-barrel section 9. As the mounting section 8 has the crevice which can contain a solid state image sensor 10 to a rear-face side and covers a solid state image sensor 10, the circuit board 5 is equipped with it. The lens to which image formation of the photographic subject image is carried out is attached in the light-receiving side of a solid state image sensor 10, and the lens-barrel section 9 is attached in the light-receiving side of a solid state image sensor 10, and the front face of the mounting section 8 which counters. As this lens unit 7 touches the side face of the ceramic package 1 of a solid state image sensor 10 in the side face of a crevice, positioning accomplishes.

[0008]
[Problem(s) to be Solved by the Invention] In the solid state image sensor using a ceramic package, processing of a ceramic is difficult, and since the package itself is expensive, it has the problem that the manufacturing cost which the assembly of a component takes becomes high. Moreover, since lens mount which covers a solid state image sensor is needed in mounting such a solid state image sensor with a lens unit on the circuit board, a lens unit part will project greatly from the circuit board, and has been the failure of a miniaturization.
[0009] Then, this invention aims at mounting the solid state image sensor efficiently on the circuit board while it reduces the manufacturing cost of a solid state image sensor.
[0010]
[Means for Solving the Problem] In the mounting approach of equipping with the solid state image sensor with which the sensor chip with which it accomplished in order that this invention might solve an above-mentioned technical problem, and two or more light-receiving pixels were arranged in the shape of a matrix was dedicated to the surface mount mold package on the circuit board with an optical lens It is larger than the light-receiving side of the sensor chip of the above-mentioned solid state image sensor to the circuit board, and an opening aperture smaller than a package is formed. It is characterized by equipping with the lens mount which covers this opening aperture and by which an optical lens is attached in one field of the above-mentioned circuit board, plugging up the above-mentioned opening aperture and equipping the field of another side of the above-mentioned circuit board with the above-mentioned solid state image sensor.
[0011] Since solid-state ****** is connectable with the circuit board by this after fixing lens mount, alignment of the lens mount to the circuit board and alignment of a solid state image sensor to the circuit board can be performed independently. Therefore, the alignment of a solid state image sensor and lens mount becomes easy on the basis of the circuit board. Moreover, since it is not necessary to equip with lens mount so that a solid state image sensor may be covered, the protrusion from the circuit board decreases.
[0012]
[Embodiment of the Invention] Drawing 1 is the decomposition perspective view showing the structure of the solid state image sensor of this invention.
[0013] Two or more light-receiving pixels and shift registers are formed of a well-known semi-conductor process on a silicon substrate, and the sensor chip 11 has the light-receiving side 12 where two or more light-receiving pixels were arranged in the shape of a matrix. The bottom member 13 consists of insulating materials, such as a glass epoxy group plate, and the central part of one field is equipped with the sensor chip 11. Moreover, two or more leads 14 which extend from the periphery of the stowed position of the sensor chip 11 to a side part are formed with electrical conducting materials, such as copper foil. These leads 14 of two or more are connected by the electrode pad and wirebonding by which the edge by the side of a center section is formed in the circumference part of the sensor chip 11 as an input/output terminal. Moreover, the locating hole 15 of a pair is formed inside [which the bottom member 13 counters] two sides. The opening 17 for the frame part material 16 being formed in the same magnitude with the same ingredient as the bottom member 13, and forming the crevice which dedicates the sensor chip 11 to a center section is formed. The locating hole 18 is formed inside [which this frame part material 16 counters] two sides as well as the bottom member 13. This bottom member 13 is stuck on the frame part material 16, and a crevice is formed by the opening 17 of the bottom member 13 and the frame part material 16. Moreover, after the bottom member 13 and the frame part material 16 are stuck, as a broken line shows to drawing 1 , the electrode connected to lead 14 is formed in those side faces. Thereby, the package of a surface mount mold is formed. In addition, lamination of the bottom member 13 and the frame part material 16 is previously performed rather than it equips the bottom member 13 with the sensor chip 11, and after formation of the locating hole 15 of the bottom member 13 and the locating hole 18 of the frame part material 16 sticks the bottom member 13 and the frame part material 16, it is made to perform it to coincidence. As the transparence plate 19 consists of a transparent ingredient to the lights, such as acrylic resin, and straddles two sides which the opening 17 of the frame part material 16 counters, the front face of the frame part material 16 is equipped with it. This transparence plate 19 is formed shorter than width of face of two sides in which the die length of one side is formed for a long time than width of face of two sides which one side of opening 17 counters and which the die length of the side of another side counters in another side of opening 17. If this equips with the transparence plate 19 so that it may straddle between two sides which opening 17 counters, it will mean having opened a part of opening 17 with as. Here, it is

equipped with it as the transparence plate 19 is wearing the light-receiving side 12 of the sensor chip 11 at least. And it fills up with transparence resin with almost same transparence plate 19 and refractive index between the sensor chip 11 and the transparence plate 19, and the sensor chip 11 and wiring are protected.
[0014] Here, the transparence resin with which it fills up between the sensor chip 11 and the transparence plate 19 is filled up with an actual production process so that the crevice formed by the opening 17 of the frame part material 16 immediately after equipping the bottom member 13 with the sensor chip 11 may be filled. And before transparence resin hardens, as it straddles, it is equipped between two sides which opening 17 counters. When there is much transparence resin with which it fills up, in order to rise by this in the part which is not covered with the transparence plate 19 of opening 17, the relief of the transparence plate 19 is not produced. On the contrary, since a crater is generated in the part which is not covered with the transparence plate 19 of opening 17 when there is little transparence resin with which it fills up, air bubbles do not mix between the light-receiving side 12 of the sensor chip 11, and the transparence plate 19.
[0015] According to such a solid state image sensor, since processing can constitute the package of a surface mount mold with an easy and cheap ingredient, compared with the case where a ceramic package is used, a manufacturing cost is sharply reducible. Moreover, by opening a part of opening 17 of the frame part material 16, and equipping with the transparence plate 19 which protects the light-receiving side 12 of the sensor chip 11, control of the fill of the transparence resin with which it is filled up between the sensor chip 11 and the transparence plate 19 becomes easy, and can improve the working efficiency of a production process.
[0016] By the way, in the case of the solid state image sensor which adopted the package of such a surface mount mold, alignment with the circuit board or optical system becomes difficult. That is, with the package of a surface mount mold, after covering a solid state image sensor and equipping with a lens unit, since connection between a solid state image sensor and the circuit board is impossible, after connecting a solid state image sensor to wiring on the circuit board by soldering beforehand, it must equip with a lens unit. However, since the irregularity by soldering arises into the circumference part of the package, the package of a surface mount mold cannot position a lens unit on the basis of the side face of a package.
[0017] Drawing 2 is a decomposition perspective view explaining the mounting approach of the solid state image sensor using the package of a surface mount mold as shown in drawing 1 , and drawing 3 is a sectional view when mounting a solid state image sensor and a lens unit on the circuit board.
[0018] A solid state image sensor 20 is the thing of the structure shown in drawing 1 , and two or more electrodes 21 connected to lead 14 are formed in the side face of the package constituted by the bottom member 13 and the frame part material 16. The circuit board 22 consists of insulating materials, such as a glass epoxy group plate, a circuit pattern is formed in the whole surface or both sides of copper foil, and the digital disposal circuit which incorporates the output of the drive circuit and solid state image sensor 20 which drive a solid state image sensor 20 is connected through these circuit patterns. The opening aperture 23 corresponding to the light-receiving side of a solid state image sensor 20 is formed, and this circuit board 22 is equipped with a solid state image sensor 20 as the transparence plate 19 is dedicated to this opening aperture 23. That is, a light-receiving side is turned to a circuit board 22 side, and it is equipped with a solid state image sensor 20 so that a photographic subject image may be received through the opening aperture 23 of the circuit board 22. Moreover, the through hole 24 corresponding to the locating hole 18 of a solid state image sensor 20 is formed in the circuit board 22 at the both sides of the opening aperture 23. The lens unit 25 consists of the mounting section 26 and the lens-barrel section 27. The gage pin 28 corresponding to the through hole 24 of the circuit board 22 is formed in a rear-face side, and the mounting section 26 lets this gage pin 28 pass to a through hole 24, and it is equipped with it so that the opening aperture 23 may be covered to a field opposite to the field where it is equipped with a solid state image sensor 20. At this time, a gage pin 28 is projected to the background of the circuit board 22, and the locating hole 18 of a solid state image sensor 20 is inserted in a part for this lobe. the lens 28 to which image formation of the photographic subject image is carried out is attached in the light-receiving side 12 of the sensor chip 11 of a solid state image sensor 20, and the lens-barrel section 27 counters the solid state image sensor 20 of the mounting section 26 -- it is attached partial picking.
[0019] That what is necessary is just to cover the opening aperture 23 of the circuit board 22, since it is not necessary to contain a solid state image sensor 20, this lens unit 25 can be small formed compared with the lens unit 7 shown in drawing 5 . Moreover, since the solid state image sensor 20 is exposed also after equipping with the lens unit 25, after determining the location of the solid state image sensor 20 to the lens

unit 25, a solid state image sensor 20 is soldered to the circuit pattern of the circuit board 22, and it can fix. Therefore, positioning of the solid state image sensor 20 and the lens unit 25 to the circuit board 22 becomes easy.

[0020] In the above example, although the case where locating holes 15 and 18 and a through hole 24 were formed in a solid state image sensor 20 and the circuit board 24 was illustrated, these holes 15, 18, and 24 may be notching corresponding to the gage pin 28 of the lens unit 25.

[0021]

[Effect of the Invention] In case the solid state image sensor which adopted the package of a surface mount mold is mounted on the circuit board according to this invention, positioning of the solid state image sensor and lens unit to the circuit board becomes easy, and simplification of an assembly stroke can be desired. Furthermore, since the lens unit itself can be made small, the big protrusion from the circuit board is lost and it is advantageous to a miniaturization.